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(54) INFORMATION PROCESSING SYSTEM AND MOUSE TYPE INPUT DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a mouse type input device capable of feeding back tactile information.
SOLUTION: This mouse 1 has a built-in piezoelectric bimorph element 14, which is linked on the rear surface of a mouse key 11. When a pointer displayed on an image display is transferred to a specific position, voltage boosted by a boosting circuit is supplied to the piezoelectric bimorph element 14. Consequently, the piezoelectric bimorph element 14 is driven and the tactile information is fed back to a user by raising the mouse key 11.

CLAIMS

[Claim(s)]

[Claim 1]An information processor.

A mouse blocking force apparatus used in order to move an image display device which displays a picture outputted by this information processor, and a pointer which is connected to said information processor and displayed on said image display device to a desired position.

Are the above the information processing system which it had, and said information processor, When said pointer reaches a specific position, have a means to transmit a specific position attainment signal to said mouse blocking force apparatus, and said mouse blocking force apparatus, It is connected to an electrostrictive actuator and this electrostrictive actuator in a case interior of this mouse blocking force apparatus, It has a booster circuit which supplies voltage which raised voltage supplied from said information processor, and rose to said electrostrictive actuator, When said specific position attainment signal is received, said booster circuit is made by supplying said voltage which rose to said electrostrictive actuator that said electrostrictive actuator should be driven.

[Claim 2]When it has the following and said pointer moves to a specific position, said booster circuit by supplying said voltage which rose to said electrostrictive actuator, A mouse blocking force apparatus used in order to move a pointer which is connected to an information processor provided with an image display device currently having made that said electrostrictive actuator should be driven, and is displayed on said image display device to a desired position.

To a case interior of this mouse blocking force apparatus, it is an electrostrictive actuator.

A booster circuit which supplies voltage which is connected to this electrostrictive actuator, raised voltage supplied from said information processor, and rose to said

electrostrictive actuator.

[Claim 3]The mouse blocking force apparatus comprising according to claim 2:
A mouse button used in order to choose an object which connects with said electrostrictive actuator, and to which said pointer points.
A depression judging means which judges whether said mouse button was pressed based on potential of an electrode of said electrostrictive actuator.
A driving stoppage means to be a case where said electrostrictive actuator is driving, and to stop said drive when judged with said mouse button having been pressed by said depression judging means.

[Claim 4]The mouse blocking force apparatus according to claim 2, wherein it has further a mouse button used in order to choose as said case an object to which said pointer points, and a different flexible region from this mouse button and this flexible region is connected with said electrostrictive actuator.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the information processing system provided with the mouse blocking force apparatus which feeds back especially the pointer position information of an information processor to a user as tactile information, and its mouse blocking force apparatus about the mouse blocking force apparatus used for the input of an information processor.
[0002]
[Description of the Prior Art]As an input device used for the input of information processors, such as a personal computer, the mouse blocking force apparatus is used from the former. Easy operation of a click, a drug, etc. is sufficient for a mouse blocking force apparatus, and moreover, since it is small and cheap, it has spread widely. However, when the conventional mouse blocking force apparatus is used, the user has to gaze at a screen in order to check the position of the pointer displayed on a picture display only by viewing. Therefore, a considerable burden will be placed on a user's eye in the case where fine pointing operation must be performed continuously.
[0003]In order to ease the burden of such an eye, the mouse blocking force apparatus in which a user can check the position of a pointer not only by vision but by a tactile sense is proposed by having a tactile-information generation machine fed back to a user by making position information on a pointer into tactile information.

[0004]The operating section of a tactile-information generation machine makes Patent Gazette No. 2571793 project from the part in a mouse button, have provided it in it, and by the operation of said operating section. The mouse blocking force apparatus (henceforth the 1st conventional technology) which can give tactile information to a user's finger with which the mouse button is touched is proposed.

[0005]Tactile-information generation machines, such as a cam driven with a pneumatic cylinder, an oil hydraulic cylinder, a direct-acting motor, the plunger driven by a solenoid, the lever driven by a solenoid, or a rotary motor, are built in JP,6-202801,A.

The operating section of this tactile-information generation machine by making a mouse button contact, A mouse blocking force apparatus constituted so that the operation of this operating section might be told to a user's hand via a mouse button. The thin tactile-information generation machine of (it being hereafter called the 2nd conventional technology), a piezo-electric formula actuator, etc. is stuck on the surface of the mouse button, The mouse blocking force apparatus (henceforth the 3rd conventional technology) constituted so that the tactile information given with this tactile-information generation machine might be directly given to a user's finger is proposed, respectively.

[0006]

[Problem(s) to be Solved by the Invention]However, since tactile information will be outputted only to the limited field in a mouse button in the 1st conventional technology mentioned above, Depending on how to touch a mouse button, the user's finger did not touch the operating section of the tactile-information generation machine, but there was a problem that tactile information may not be fed back.

[0007]Even if it is a case where the mechanism of the gap which wants to mention a tactile-information generation machine above is used in the 2nd conventional technology mentioned above, in order to compare with the mouse blocking force apparatus which is not provided with such a tactile-information generation machine, and for weight to become heavy and to enlarge moreover, there was a problem that operativity got worse remarkably.

[0008]In the 3rd conventional technology mentioned above, in order that a tactile-information generation machine might be formed on the surface of a mouse button and a user might touch a tactile-information generation machine directly, there was a problem that a tactile-information generation machine was easy to be destroyed by a pressure, static electricity, etc. which are added when carrying out the depression of the mouse button.

[0009]This invention is made in view of this situation, and is a thing.

The purpose is to provide a user with the information processing system and mouse blocking force apparatus which can feed back tactile information by using a small and

lightweight electrostrictive actuator as a vessel, without spoiling operativity.

[0010]Since other purposes of this invention can be built in in a device by using a small electrostrictive actuator as a tactile-information generation machine, they are in offer of the information processing system with which a tactile-information generation machine is hard to be destroyed, and a mouse blocking force apparatus.
[0011]In order to raise the whole mouse button by connecting an electrostrictive actuator with a mouse button, other purposes of this invention are not based on how to touch a mouse button, but are in offer of the mouse blocking force apparatus which can feed back tactile information to a user.
[0012]By other purposes of this invention providing a different flexible region from a mouse button furthermore, and connecting an electrostrictive actuator with this flexible region, Even if it is during the drag operation operated while pressing a mouse button, it is in offer of the mouse blocking force apparatus which can feed back tactile information to a user.
[0013]
[Means for Solving the Problem]An image display device with which an information processing system concerning the 1st invention displays a picture to which it is outputted by information processor and this information processor, In an information processing system provided with a mouse blocking force apparatus used in order to move a pointer which is connected to said information processor and displayed on said image display device to a desired position, When said pointer reaches a specific position, said information processor is provided with a means to transmit a specific position attainment signal to said mouse blocking force apparatus, and said mouse blocking force apparatus, It is connected to an electrostrictive actuator and this electrostrictive actuator in a case interior of this mouse blocking force apparatus, It has a booster circuit which supplies voltage which raised voltage supplied from said information processor, and rose to said electrostrictive actuator, When said specific position attainment signal is received, said booster circuit is made by supplying said voltage which rose to said electrostrictive actuator that said electrostrictive actuator should be driven.
[0014]In a mouse blocking force apparatus used in order to move a pointer which a mouse blocking force apparatus concerning the 2nd invention is connected to an information processor provided with an image display device, and is displayed on said image display device to a desired position, It is connected to an electrostrictive actuator and this electrostrictive actuator in a case interior of this mouse blocking force apparatus, It has a booster circuit which supplies voltage which raised voltage supplied from said information processor, and rose to said electrostrictive actuator, When said pointer moves to a specific position, said booster circuit is made by supplying said voltage which rose to said electrostrictive actuator that said

electrostrictive actuator should be driven.

[0015]When based on the 1st invention and the 2nd invention, a mouse blocking force apparatus contains a booster circuit which supplies voltage which is connected to an electrostrictive actuator and this electrostrictive actuator, raised voltage supplied from an information processor, and rose to said electrostrictive actuator. And when a pointer currently displayed on an image display device reaches a specific position, a signal which shows that is transmitted to a mouse blocking force apparatus from an information processor. When a mouse blocking force apparatus receives this signal, a booster circuit supplies said voltage which rose to an electrostrictive actuator. As a result, an electrostrictive actuator can be driven.

[0016]Thus, when a pointer moves to a position with a specific position of an icon or a window, etc., tactile information can be fed back to a user by making a piezoelectric bimorph element drive.

[0017]the usual mouse blocking force apparatus which does not have a tactile-information generation machine even if it is a case where it builds in a device, since an electrostrictive actuator is lightweight small -- abbreviated, since it can be considered as same size and weight, Since operativity is not spoiled like the conventional mouse blocking force apparatus which has a tactile-information generation machine and it moreover is not touched directly from the exterior, it is hard to be destroyed.

[0018]In order to drive an electrostrictive actuator, as compared with voltage supplied to a mouse blocking force apparatus, high voltage is required from an information processor. Therefore, an electrostrictive actuator can be made to drive by having a booster circuit and raising voltage supplied from an information processor to voltage required since an electrostrictive actuator is driven.

[0019]A mouse blocking force apparatus which this invention requires for the 3rd invention is characterized by that a mouse blocking force apparatus concerning the 2nd invention comprises:

A mouse button used in order to choose an object which connects with said electrostrictive actuator, and to which said pointer points.

A depression judging means which judges whether said mouse button was pressed based on potential of an electrode of said electrostrictive actuator.

A driving stoppage means to be a case where said electrostrictive actuator is driving, and to stop said drive when judged with said mouse button having been pressed by said depression judging means.

[0020]When based on the 3rd invention, it has a mouse button used in order to choose an object to which a pointer points, and this mouse button and electrostrictive actuator are connected. Based on potential of an electrode of an electrostrictive actuator, it has a depression judging means which judges whether a mouse button was

pressed, When making an electrostrictive actuator drive and it is judged with said mouse button having been pressed by a depression judging means, it has a driving stoppage means to stop a drive of an electrostrictive actuator.

[0021]Thus, since an electrostrictive actuator which is a tactile-information generation machine has connected with a mouse button and the whole mouse button can be raised by making an electrostrictive actuator drive, it cannot be based on how to touch a mouse, but tactile information can be fed back to a user.

[0022]While an electrostrictive actuator is driving, will be raised by mouse button, but. In such a case, since it compares in the usual case and stronger pushing down force is needed in order to choose an object to which a pointer points and to carry out the depression of the mouse button, operativity will be spoiled. Therefore, when it is detected based on potential of an electrode of an electrostrictive actuator that a user pressed a mouse button, a drive of an electrostrictive actuator is stopped. It becomes possible to carry out the depression of the mouse button with the same pushing down force as the usual case by this. Thus, since the electrostrictive actuator can also play a role of a sensor which detects a pressure, in order to judge whether a mouse button was pressed, it is not necessary to have a special sensor.

[0023]In a mouse blocking force apparatus which a mouse blocking force apparatus concerning the 4th invention requires for the 2nd invention, It has further a mouse button used in order to choose as said case an object to which said pointer points, and a different flexible region from this mouse button, and this flexible region is connected with said electrostrictive actuator.

[0024]When based on the 4th invention, the upper part of body casing is equipped with a flexible region other than a mouse button, and this flexible region and electrostrictive actuator are connected with it.

[0025]Thus, when a pointer moves to a position with a specific position of an icon or a window, etc., even if it is during drag operation operated while pressing a mouse button by raising a different portion from a mouse button, tactile information can be fed back to a user.

[0026]

[Embodiment of the Invention]Hereafter, this invention is explained in full detail based on the drawing in which the embodiment is shown.

(Embodiment 1) Drawing 1 is a key map showing the example of composition of the information processing system of this invention. In drawing 1, 1 shows the mouse blocking force apparatus (henceforth a mouse), and this mouse 1 is connected to the personal computer 2 (henceforth PC). PC2 is connected to the image display device 3 for displaying a picture.

[0027]The user can move the pointer 30 currently displayed on the image display device 3 via PC2 by using the mouse 1 to the position by which the desired position 31, for example, an icon, or the window 32 is arranged.

[0028]Drawing 2 is a schematic diagram showing the appearance of the mouse 1 of the embodiment of the invention 1. In drawing 2, 10 shows the mouse case of the mouse 1 and 11 shows the mouse button which a user operates. 12 shows the connecting cable for connecting the mouse 1 and PC2.

[0029]Drawing 3 is a partially broken side view of the mouse 1 of the embodiment of the invention 1. In drawing 3, 13 shows the mouse ball projected from the undersurface of the mouse case 10, and this mouse ball 13 is supported inside the mouse case 10 so that it can rotate freely according to the move direction and movement magnitude of the mouse 1.

[0030]14 shows the piezoelectric bimorph element (Murata Manufacturing-KF02C5) which functions as an actuator, and the inside of the mouse case 10 is equipped with this piezoelectric bimorph element 14. The piezoelectric element 140,141 of two sheets which makes tabular [rectangular] as well as both sides of the metal plate 142 which makes tabular [rectangular] is stuck, and the piezoelectric bimorph element 14 is constituted. And the electrodes 140a and 140b are formed in both sides of the piezoelectric element 140, and similarly the electrodes 141a and 141b are formed in both sides of the piezoelectric element 141, and the electrodes 140b and 141b touch the metal plate 142. Therefore, one electrode consists of the electrodes 140b and 141b and the metal plate 142. And the lead 16 for connecting with the drive circuit mentioned later is connected to the end of the metal plate 142. The leads 17 and 18 are connected to the electrodes 140a and 141a, respectively.

[0031]The holding part 15 which protruded inside is formed in the inner upper face of the mouse case 10, and the end of the rectangle of the piezoelectric bimorph element 14 is being fixed by this holding part 15. The other end of the piezoelectric bimorph element 14 is connected with the rear face of the mouse button 11 inside the mouse case 10.

[0032]Drawing 4 is a block diagram showing the electric constitution of the mouse 1 of the embodiment of the invention 1. The mouse 1 is provided with the following as shown in drawing 4.

MPU100.

The signal generating circuit 101 which generates the signal which shows the movement magnitude of the mouse 1.

The booster circuit 102 which raises the voltage supplied via the connecting cable 12 from PC2.

The drive circuit 103 which supplies the piezoelectric bimorph element 14 and the voltage which rose by the booster circuit 102 via the lead 16 to the piezoelectric bimorph element 14.

It is connected with PC2, and MPU100 transmits and receives the data of the position information on a pointer, etc. between PC2.

[0033]The signal generating circuit 101 detects the hand of cut and rotation of the

mouse ball 13 using publicly known means, such as a potentiometer or an encoder, generates the signal which shows the movement magnitude of the mouse 1 based on this hand of cut and rotation, and outputs the generated signal to MPU100. MPU100 sends this signal to PC2 via the connecting cable 12, and moves the position of the pointer 30 based on this signal in PC2.

[0034]Voltage not more than direct-current 30V which the booster circuit 102 is a publicly known pressure-up type DC-DC converter, and is supplied to the booster circuit 102 via the connecting cable 12 from PC2 (usually) The voltage beyond direct-current 40V (about [Usually 200] V) required since the piezoelectric bimorph element 14 drives about 5V is raised. ON-and-OFF control of this booster circuit 102 is carried out by the signal outputted from MPU100.

[0035]As the drive circuit 103 is mentioned later, the piezoelectric bimorph element 14 is made to drive by supplying the voltage which rose by the booster circuit 102 to the piezoelectric bimorph element 14 via the leads 16 and 17 or 18. This drive circuit 103 operates according to the signal outputted from MPU100.

[0036]Composition which carries out direct supply of the voltage which rose by the booster circuit 102 from the booster circuit 102 to the piezoelectric bimorph element 14 may be used, without forming the drive circuit 103.

[0037]Drawing 5 is a circuit diagram showing connection of the booster circuit 102 in the embodiment of the invention 1, the drive circuit 103, and the piezoelectric bimorph element 14. In drawing 5, the drive circuit 103 supplies the voltage which rose by the booster circuit 102 to the piezoelectric bimorph element 14 by flowing through the terminals 103a and 103b or the terminals 103a and 103c, respectively. Here, when the drive circuit 103 flows through the terminals 103a and 103b, voltage is supplied to the metal plate 142, therefore the piezoelectric element 141 contracts in the length direction. Thereby, the piezoelectric bimorph element 14 is crooked caudad. When the drive circuit 103 flows through the terminals 103a and 103c, voltage is supplied to the electrode 140a and, as a result, the piezoelectric element 140 contracts in the length direction. Thereby, the piezoelectric bimorph element 14 is crooked up.

[0038]Thus, when the piezoelectric bimorph element 14 is crooked up, the mouse button 11 connected with the piezoelectric bimorph element 14 as mentioned above is raised. In this case, when the mouse button 11 is pressed by the user, a pressure is added to the piezoelectric bimorph element 14, and, as a result, the potential of the electrode 140a of the piezoelectric element 140 changes. MPU100 is supervising the potential of the electrode 140a by measuring the voltage of the both ends of the resistance R. And when it is detected that the potential of the electrode 140a carried out specified quantity change when the voltage of the both ends of the resistance R changed, MPU100 judges that the mouse button 11 was pressed by the user.

[0039]Drawing 6 is a flow chart which shows the procedure of MPU100 in the embodiment of the invention 1. MPU100 is supervising the output from the signal

generating circuit 101. When a user moves the mouse 1 here and the mouse ball 13 rotates in connection with this, the signal generating circuit 101 generates the mouse shift signal which shows the movement magnitude of the mouse 1 based on the hand of cut and rotation of the mouse ball 13, and outputs this mouse shift signal to MPU100.

[0040]MPU100 receives the mouse shift signal outputted from the signal generating circuit 101, when it is judged that the mouse 1 moved (it is YES at S101), outputs the signal which shows switch control to the booster circuit 102, and makes the booster circuit 102 an ON state (S102). Thereby, the booster circuit 102 raises the voltage currently supplied from PC2. The drive circuit 103 is making it flow through the terminals 103a and 103b at this time. Therefore, the voltage which rose by the booster circuit 102 will be supplied to the metal plate 142, and, as a result, the piezoelectric bimorph element 14 will be crooked caudad. When not receiving a mouse shift signal from the signal generating circuit 101 (it is NO at S101), Step S101 is repeated until it receives this signal.

[0041]PC2 sends the tactile information output signal which orders the output of tactile information to MPU100, when the pointer 30 reaches a position with a specific position etc. by which the object of the icon 31 or the window 32 grade is arranged. This specific position can be set up in PC2.

[0042]It is judged whether MPU100 received the tactile information output signal from PC2 (S103). When it judges with not having received a tactile information output signal here (it is NO at S103), MPU100 judges whether movement of the mouse 1 stopped, in order not to receive the mouse shift signal outputted from the signal generating circuit 101 (S104). When it judges with movement of the mouse 1 having stopped here (it is YES at S104), it is judged whether it passed for 10 seconds after it starts a time check from the time of judging and the mouse 1 suspends movement (S105).

[0043]When it judges with having passed for 10 seconds at Step S105 (it is YES at S105), MPU100 outputs the signal which shows OFF control to the booster circuit 102, makes the booster circuit 102 an OFF state (S106), and returns to Step S101.

[0044]When it judges with movement of the mouse 1 not having stopped at Step S104 on the other hand (it is NO at S104), And since the mouse shift signal outputted from the signal generating circuit 101 after movement of the mouse 1 stops before passing for 10 seconds was received, when it judges with the mouse 1 not having stopped for 10 seconds (it is NO at S105), it returns to Step S103.

[0045]When it judges with having received the tactile information output signal from the mouse 1 at Step S103 (it is YES at S103), MPU100, The drive start control signal which shows making the piezoelectric bimorph element 14 drive so that it may be crooked upward is outputted to the drive circuit 103 by shrinking the piezoelectric element 140 of the piezoelectric bimorph element 14 (S107). Thereby, the drive circuit 103 supplies the voltage which rose by the booster circuit 102 by flowing through the

terminals 103a and 103c to the electrode 140a of the piezoelectric element 140 of the piezoelectric bimorph element 14. As a result, the piezoelectric bimorph element 14 is crooked up, and the mouse button 11 is raised.

[0046]Next, MPU100 judges whether the mouse button 11 was pressed by whether the potential of the electrode 140a of the piezoelectric element 140 in the piezoelectric bimorph element 14 carried out specified quantity change, and the user (S108). When it judges with not having been pushed here (it is NO at S108), since the pointer 30 separated from the specific position, MPU100 judges whether the tactile-information stop signal which orders to suspend the output of tactile information was received from PC2 (S109). And when it judges with not having received a tactile-information stop signal, it returns to NO) and Step S108 by (S109.

[0047]When it judges with the mouse button 11 having been pressed at Step S108 (it is YES at S108), Or when it judges with having received the tactile-information stop signal at Step S109 (it is YES at S109), MPU100 outputs the drive-stop-control signal which shows that a drive which is crooked upward in the piezoelectric bimorph element 14 is stopped to the drive circuit 103 (S110). Thereby, the piezoelectric bimorph element 14 is caudad crooked by the drive circuit's 103 making it flow through the terminals 103a and 103b, and as a result supplying voltage to the metal plate 142. Thereby, the state where the mouse button 11 was raised is canceled. Therefore, the user can do the depression of the mouse button 11 by applying the usual pushing down force. He follows back MPU100 of Step S110 to Step S104.

[0048]The amount of change of the piezoelectric bimorph element 14 is controllable by adjusting the height of the voltage raised by the booster circuit 102. Therefore, the amount of change of the piezoelectric bimorph element 14 can also be arbitrarily set up by a user's liking.

[0049]It may be made to provide a projection in the surface of the mouse button 11. Drawing 7 is a side view of the mouse 1 of the embodiment of the invention 1 which provided the projection in the surface of the mouse button 11. The projection 19 is formed in the surface of the mouse button 11 as shown in drawing 7. When a user places a finger on this projection 19 and operates the mouse 1, it becomes possible to give tactile information more effectively to a user.

[0050](Embodiment 2) Drawing 8 is a schematic diagram showing the appearance of the mouse blocking force apparatus of the embodiment of the invention 2. In drawing 8, 20 shows a mouse blocking force apparatus (henceforth a mouse), and the flexible region 22 which is different in the mouse button 11 is established in the upper part of the mouse case 21 of this mouse 20. Since other composition is the same as that of the mouse 1 of Embodiment 1, identical codes are attached and explanation is omitted.

[0051]Drawing 9 is a partially broken side view of the mouse 20 of the embodiment of the invention 2. In drawing 9, 23 shows the piezoelectric bimorph element which functions as an electrostrictive actuator, and the inside of the mouse case 21 is

equipped with this piezoelectric bimorph element 23. Since the composition of the piezoelectric bimorph element 23 is the same as the composition of the piezoelectric bimorph element 14 in Embodiment 1, the explanation is omitted.

[0052]The holding part 24 which protruded inside is formed in the inner upper face of the mouse case 21, and the end of the rectangle of the piezoelectric bimorph element 23 is being fixed by this holding part 24. The other end of the piezoelectric bimorph element 23 is connected with the rear face of the flexible region 22 inside the mouse case 21.

[0053]In the mouse 20 constituted in this way, the piezoelectric bimorph element 23 is driven like the piezoelectric bimorph element 14 in Embodiment 1. And when the piezoelectric bimorph element 23 is crooked up, the flexible region 22 is flattered.

[0054]In order to make it raised in the mouse button 11 in the case of the mouse 1 in Embodiment 1, when there is operation performed while maintaining the state where the mouse buttons 11, such as drag operation, were pressed, tactile information cannot be fed back to a user. In the mouse 20 of Embodiment 2, since the flexible region 22 which is different in the mouse button 11 is flattered as mentioned above, even if it is a case where drag operation etc. are being performed, it becomes possible to feed back tactile information to a user.

[0055]

[Effect of the Invention]As explained in full detail above, according to the information processing system according to claim 1 and the mouse blocking force apparatus according to claim 2, tactile information can be fed back to a user by using a small and lightweight electrostrictive actuator as a tactile-information generation machine, without spoiling operativity.

[0056]Since it can build in a device by using a small electrostrictive actuator as a tactile-information generation machine, a tactile-information generation machine is hard to be destroyed.

[0057]Since the whole mouse button can be raised by connecting an electrostrictive actuator with a mouse button according to the mouse blocking force apparatus according to claim 3, it cannot be based on how to touch a mouse, but tactile information can be fed back to a user.

[0058]When a user presses a mouse button, by suspending the aggressiveness raising of a mouse button, the user can do the depression of the mouse button with the usual pushing down force.

[0059]By according to the mouse blocking force apparatus according to claim 4, establishing a different flexible region from a mouse button in the upper part of a case, and connecting an electrostrictive actuator with this flexible region, Even if it is during the drag operation operated while pressing a mouse button, this invention does the outstanding effect so -- tactile information can be fed back to a user.

[0060](Additional remark) The following paragraphs are further indicated to

explanation [still more more than].

(1) The mouse blocking force apparatus according to any one of claims 2 to 4 currently having made said booster circuit that pressure up of the input voltage not more than 30V should be carried out to the output voltage beyond 40V.

(2) The mouse blocking force apparatus according to any one of claims 2 to 4 currently having made that it should have further a voltage control means which controls said voltage which rose, and the drive of said piezo-electric AKUCHUE - TA should be controlled.

(3) The mouse blocking force apparatus according to any one of claims 2 to 4, wherein the electrical link of the electrode which said piezo-electric AKUCHUE - TA has, and said booster circuit is made by the fixed side of piezo-electric AKUCHUE - TA.

(4) The mouse blocking force apparatus according to any one of claims 2 to 4, wherein the projection is prepared for said mouse button or said flexible region.

(5) Said booster circuit raises the voltage supplied from said information processor when said mouse blocking force apparatus is operated, The mouse blocking force apparatus according to any one of claims 2 to 4 currently having made that said rise should be suspended when said mouse blocking force apparatus is not operated beyond as for predetermined time.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a key map showing the example of composition of the information processing system of this invention.

[Drawing 2]It is a schematic diagram showing the appearance of the mouse of the embodiment of the invention 1.

[Drawing 3]It is a partially broken side view of the mouse of the embodiment of the invention 1.

[Drawing 4]It is a block diagram showing the electric constitution of the mouse of the embodiment of the invention 1.

[Drawing 5]It is a circuit diagram showing connection of the booster circuit in the embodiment of the invention 1, a drive circuit, and a piezoelectric bimorph element.

[Drawing 6]It is a flow chart which shows the procedure of MPU.

[Drawing 7]It is a side view of the mouse of the embodiment of the invention 1 which provided the projection on the surface of the mouse button.

[Drawing 8]It is a schematic diagram showing the appearance of the mouse of the embodiment of the invention 2.

[Drawing 9]It is a partially broken side view of the mouse of the embodiment of the

invention 2.

[Description of Notations]

1 Mouse blocking force apparatus

10 Mouse case

11 Mouse button

13 Mouse ball

14, 23 piezoelectric-bimorph element

22 Flexible region

101 Signal generating circuit

102 Booster circuit

103 Drive circuit

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DEVICE
</B></TD></TR><TR><TD VALIGN="top">(57)Abstract:
PROBLEM TO BE
SOLVED: To provide a mouse type input device capable of feeding back tactile
information.
SOLUTION: This mouse 1 has a built-in piezoelectric bimorph
element 14which is linked on the rear surface of a mouse key 11. When a pointer
displayed on an image display is transferred to a specific positionvoltage
boosted by a boosting circuit is supplied to the piezoelectric bimorph element
14. Consequentlythe piezoelectric bimorph element 14 is driven and the tactile
information is fed back to a user by raising the mouse key
11.

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delete --><!--__CORRECT_DELETE__<HR WIDTH="100%" SIZE="5">CORRECTION
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BORDER="0">__CORRECT_DATA__</TABLE>__CORRECT_DELETE__--><HR><B>CLAIMS</B><HR><SDO
CLJ><DP N=0002><TXF FR=0001 HE=235 WI=080 LX=0200 LY=0300>[Claim(s)]
[Claim
1]An information processor.
A mouse blocking force apparatus used in order to
move an image display device which displays a picture outputted by this
information processorand a pointer which is connected to said information
processor and displayed on said image display device to a desired
position.
Are the above the information processing system which it hadand said
information processorWhen said pointer reaches a specific positionhave a means to
transmit a specific position attainment signal to said mouse blocking force
apparatusand said mouse blocking force apparatusIt is connected to an
electrostrictive actuator and this electrostrictive actuator in a case interior
of this mouse blocking force apparatusIt has a booster circuit which supplies
voltage which raised voltage supplied from said information processorand rose to

said electrostrictive actuatorWhen said specific position attainment signal is receivedsaid booster circuit is made by supplying said voltage which rose to said electrostrictive actuator that said electrostrictive actuator should be driven.

[Claim 2]When it has the following and said pointer moves to a specific positionsaid booster circuit by supplying said voltage which rose to said electrostrictive actuatorA mouse blocking force apparatus used in order to move a pointer which is connected to an information processor provided with an image display device currently having made that said electrostrictive actuator should be drivenand is displayed on said image display device to a desired position.
To a case interior of this mouse blocking force apparatusit is an electrostrictive actuator.
A booster circuit which supplies voltage which is connected to this electrostrictive actuatorraised voltage supplied from said information processorand rose to said electrostrictive actuator.

[Claim 3]The mouse blocking force apparatus comprising according to claim 2:
A mouse button used in order to choose an object which connects with said electrostrictive actuatorand to which said pointer points.
A depression judging means which judges whether said mouse button was pressed based on potential of an electrode of said electrostrictive actuator.
A driving stoppage means to be a case where said electrostrictive actuator is drivingand to stop said drive when judged with said mouse button having been pressed by said depression judging means.

[Claim 4]The mouse blocking force apparatus according to claim 2wherein it has further a mouse button used in order to choose as said case an object to which said pointer pointsand a different flexible region from this mouse button and this flexible region is connected with said electrostrictive actuator.
</SDO>
<HR><B>DETAILED DESCRIPTION</B><HR><SDO DEJ><TXF FR=0002 HE=015 WI=080 LX=0200 LY=2650>[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention <TXF FR=0003 HE=250 WI=080 LX=1100 LY=0300>relates to the information processing system provided with the mouse blocking force apparatus which feeds back especially the pointer position information of an information processor to a user as tactile informationand its mouse blocking force apparatus about the mouse blocking force apparatus used for the input of an information processor.
[0002]
[Description of the Prior Art]As an input device used for the input of information processorssuch as a personal computerthe mouse blocking force apparatus is used from the former. Easy operation of a clicka drugetc. is sufficient for a mouse blocking force apparatusand moreoversince it is small and cheapit has spread widely. Howeverwhen the conventional mouse blocking force apparatus is usedthe user has to gaze at a screen in order to check the position of the pointer displayed on a picture display only by viewing. Thereforea considerable burden will be placed on a user's eye in the case where fine pointing operation must be performed continuously.
[0003]In order to ease the burden of such an eyethe mouse blocking force apparatus in which a user can check the position of a pointer not only by vision but by a tactile sense is proposed by having a tactile-information generation machine fed back to a user by making position information on a pointer into tactile information.
[0004]The operating section of a tactile-information generation machine makes Patent Gazette No. 2571793 project from the part in a mouse buttonhave provided it in itand by the operation of said operating section. The mouse blocking force apparatus (henceforth the 1st conventional technology) which can give tactile information to a user's finger with which the mouse button is touched is proposed.
[0005]Tactile-information generation machinessuch as a cam driven with a pneumatic cylinderan oil hydraulic cylindera direct-acting motorthe plunger driven by a solenoidthe lever driven by a solenoidor a rotary motorare built in JP6-202801A.
The operating section of this tactile-information generation machine by making a mouse button contactA mouse blocking force apparatus constituted so that the operation of this operating section might be told to a user's hand via a mouse button. The thin tactile-information generation machine of (it being hereafter called the 2nd conventional technology)a piezo-electric formula actuatoretc. is stuck on the surface of the mouse buttonThe mouse blocking force apparatus (henceforth the 3rd conventional technology) constituted so that the tactile information given with this tactile-information generation machine might be directly given to a user's finger is proposedrespectively.

[0006]
[Problem(s) to be Solved by the Invention]Howeversince tactile information will be outputted only to the limited field in a mouse button in the 1st conventional technology mentioned aboveDepending on how to touch a mouse buttonthe user's finger did not touch the operating section of the tactile-information generation machinebut there was a problem that tactile information may not be fed back.
[0007]<DP N=0003><TXF

FR=0001 HE=250 WI=080 LX=0200 LY=0300>Even if it is a case where the mechanism of the gap which wants to mention a tactile-information generation machine above is used in the 2nd conventional technology mentioned abovein order to compare with the mouse blocking force apparatus which is not provided with such a tactile-information generation machineand for weight to become heavy and to enlarge moreoverthere was a problem that operativity got worse remarkably.
[0008]In the 3rd conventional technology mentioned abovein order that a tactile-information generation machine might be formed on the surface of a mouse button and a user might touch a tactile-information generation machine directlythere was a problem that a tactile-information generation machine was easy to be destroyed by a pressurestatic electricityetc. which are added when carrying out the depression of the mouse button.
[0009]This invention is made in view of this situationand is a thing.
The purpose is to provide a user with the information processing system and mouse blocking force apparatus which can feed back tactile information by using a small and lightweight electrostrictive actuator as a vesselwithout spoiling operativity.

[0010]Since other purposes of this invention can be built in in a device by using a small electrostrictive actuator as a tactile-information generation machinethey are in offer of the information processing system with which a tactile-information generation machine is hard to be destroyedand a mouse blocking force apparatus.
[0011]In order to raise the whole mouse button by connecting an electrostrictive actuator with a mouse buttonother purposes of this invention are not based on how to touch a mouse buttonbut are in offer of the mouse blocking force apparatus which can feed back tactile information to a user.
[0012]By other purposes of this invention providing a different flexible region from a mouse button furthermoreand connecting an electrostrictive actuator with this flexible regionEven if it is during the drag operation operated while pressing a mouse buttonit is in offer of the mouse blocking force apparatus which can feed back tactile information to a user.
[0013]
[Means for Solving the Problem]An image display device with which an information processing system concerning the 1st invention displays a picture to which it is outputted by information processor and this information processorIn an information processing system provided with a mouse blocking force apparatus used in order to move a pointer which is connected to said information processor and displayed on said image display device to a desired positionWhen said pointer reaches a specific positionsaid information processor is provided with a means to transmit a specific position attainment signal to said mouse blocking force apparatusand said mouse blocking force apparatusIt is connected to an electrostrictive actuator and this electrostrictive actuator in a case interior of this mouse blocking force apparatusIt has a booster circuit which supplies voltage which raised voltage supplied from said information processorand rose to said electrostrictive actuatorWhen said specific position attainment signal is receivedsaid booster circuit is made by supplying said voltage which rose to said electrostrictive actuator that said electrostrictive actuator should be driven.
[0014]<TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300>In a mouse blocking force apparatus used in order to move a pointer which a mouse blocking force apparatus concerning the 2nd invention is connected to an information processor provided with an image display deviceand is displayed on said image display device to a desired positionIt is connected to an electrostrictive actuator and this electrostrictive actuator in a case interior of this mouse blocking force apparatusIt has a booster circuit which supplies voltage which raised voltage supplied from said information processorand rose to said electrostrictive actuatorWhen said pointer moves to a specific positionsaid booster circuit is made by supplying said voltage which rose to said electrostrictive actuator that said electrostrictive actuator should be driven.
[0015]When based on the 1st invention and the 2nd inventiona mouse blocking force apparatus contains a booster circuit which supplies voltage which is connected to an electrostrictive actuator and this electrostrictive actuatorraised voltage supplied from an information processorand rose to said electrostrictive actuator. And when a pointer currently displayed on an image display device reaches a specific positiona signal which shows that is transmitted to a mouse blocking force apparatus from an information processor. When a mouse blocking force apparatus receives this signala booster circuit supplies said voltage which rose to an electrostrictive actuator. As a resultan electrostrictive actuator can be driven.
[0016]Thuswhen a pointer moves to a position with a specific position of an icon or a windowetc.tactile information can be fed back to a user by making a piezoelectric bimorph element drive.
[0017]the usual mouse blocking force apparatus which does not have a tactile-information generation machine even if it

is a case where it builds in a devicesince an electrostrictive actuator is lightweight small -- abbreviatedsince it can be considered as same size and weightSince operativity is not spoiled like the conventional mouse blocking force apparatus which has a tactile-information generation machine and it moreover is not touched directly from the exteriorit is hard to be destroyed.
[0018]In order to drive an electrostrictive actuatoras compared with voltage supplied to a mouse blocking force apparatushigh voltage is required from an information processor. Thereforean electrostrictive actuator can be made to drive by having a booster circuit and raising voltage supplied from an information processor to voltage required since an electrostrictive actuator is driven.
[0019]A mouse blocking force apparatus which this invention requires for the 3rd invention is characterized by that a mouse blocking force apparatus concerning the 2nd invention comprises:
A mouse button used in order to choose an object which connects with said electrostrictive actuatorand to which said pointer points.
A depression judging means which judges whether said mouse button was pressed based on potential of an electrode of said electrostrictive actuator.
A driving stoppage means to be a case where said electrostrictive actuator is drivingand to stop said drive when judged with said mouse button having been pressed by said depression judging means.

[0020]When based on the 3rd inventionit <DP N=0004><TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300>has a mouse button used in order to choose an object to which a pointer pointsand this mouse button and electrostrictive actuator are connected. Based on potential of an electrode of an electrostrictive actuatorit has a depression judging means which judges whether a mouse button was pressedWhen making an electrostrictive actuator drive and it is judged with said mouse button having been pressed by a depression judging meansit has a driving stoppage means to stop a drive of an electrostrictive actuator.
[0021]Thussince an electrostrictive actuator which is a tactile-information generation machine has connected with a mouse button and the whole mouse button can be raised by making an electrostrictive actuator driveit cannot be based on how to touch a mousebut tactile information can be fed back to a user.
[0022]While an electrostrictive actuator is drivingwill be raised by mouse buttonbut. In such a casesince it compares in the usual case and stronger pushing down force is needed in order to choose an object to which a pointer points and to carry out the depression of the mouse buttonoperativity will be spoiled. Thereforewhen it is detected based on potential of an electrode of an electrostrictive actuator that a user pressed a mouse buttona drive of an electrostrictive actuator is stopped. It becomes possible to carry out the depression of the mouse button with the same pushing down force as the usual case by this. Thussince the electrostrictive actuator can also play a role of a sensor which detects a pressurein order to judge whether a mouse button was pressedit is not necessary to have a special sensor.
[0023]In a mouse blocking force apparatus which a mouse blocking force apparatus concerning the 4th invention requires for the 2nd inventionIt has further a mouse button used in order to choose as said case an object to which said pointer pointsand a different flexible region from this mouse buttonand this flexible region is connected with said electrostrictive actuator.
[0024]When based on the 4th inventionthe upper part of body casing is equipped with a flexible region other than a mouse buttonand this flexible region and electrostrictive actuator are connected with it.
[0025]Thuswhen a pointer moves to a position with a specific position of an icon or a windowetc.even if it is during drag operation operated while pressing a mouse button by raising a different portion from a mouse buttontactile information can be fed back to a user.
[0026]
[Embodiment of the Invention]Hereafterthis invention is explained in full detail based on the drawing in which the embodiment is shown.
(Embodiment 1) <A HREF="JP-A-2001-202195.files/000003.gif">Drawing 1 </A>is a key map showing the example of composition of the information processing system of this invention. In <A HREF="JP-A-2001-202195.files/000003.gif">drawing 1</A>1 shows the mouse blocking force apparatus (henceforth a mouse)and this mouse 1 is connected to the personal computer 2 (henceforth PC). PC2 is <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300>connected to the image display device 3 for displaying a picture.
[0027]The user can move the pointer 30 currently displayed on the image display device 3 via PC2 by using the mouse 1 to the position by which the desired position 31for examplean iconor the window 32 is arranged.
[0028]<A HREF="JP-A-2001-202195.files/000004.gif">Drawing 2 </A>is a schematic diagram showing the appearance of the mouse 1 of the embodiment of the invention 1. In <A HREF="JP-A-2001-202195.files/000004.gif">drawing 2</A>10 shows the mouse case of the mouse 1 and 11 shows the mouse button which a user operates. 12 shows the connecting cable for connecting the mouse 1 and PC2.
[0029]<A

HREF="JP-A-2001-202195.files/000005.gif">Drawing 3 </A>is a partially broken side view of the mouse 1 of the embodiment of the invention 1. In <A HREF="JP-A-2001-202195.files/000005.gif">drawing 3</A>13 shows the mouse ball projected from the undersurface of the mouse case 10and this mouse ball 13 is supported inside the mouse case 10 so that it can rotate freely according to the move direction and movement magnitude of the mouse 1.
[0030]14 shows the piezoelectric bimorph element (Murata Manufacturing-KF02C5) which functions as an actuatorand the inside of the mouse case 10 is equipped with this piezoelectric bimorph element 14. The piezoelectric element 140141 of two sheets which makes tabular [rectangular] as well as both sides of the metal plate 142 which makes tabular [rectangular] is stuckand the piezoelectric bimorph element 14 is constituted. And the electrodes 140a and 140b are formed in both sides of the piezoelectric element 140and similarly the electrodes 141a and 141b are formed in both sides of the piezoelectric element 141and the electrodes 140b and 141b touch the metal plate 142. Thereforeone electrode consists of the electrodes 140b and 141b and the metal plate 142. And the lead 16 for connecting with the drive circuit mentioned later is connected to the end of the metal plate 142. The leads 17 and 18 are connected to the electrodes 140a and 141arespectively.
[0031]The holding part 15 which protruded inside is formed in the inner upper face of the mouse case 10and the end of the rectangle of the piezoelectric bimorph element 14 is being fixed by this holding part 15. The other end of the piezoelectric bimorph element 14 is connected with the rear face of the mouse button 11 inside the mouse case 10.
[0032]<A HREF="JP-A-2001-202195.files/000006.gif">Drawing 4 </A>is a block diagram showing the electric constitution of the mouse 1 of the embodiment of the invention 1. The mouse 1 is provided with the following as shown in <A HREF="JP-A-2001-202195.files/000006.gif">drawing 4</A>.
MPU100.
The signal generating circuit 101 which generates the signal which shows the movement magnitude of the mouse 1.
The booster circuit 102 which raises the voltage supplied via the connecting cable 12 from PC2.
The drive circuit 103 which supplies the piezoelectric bimorph element 14 and the voltage which rose by the booster circuit 102 via the lead 16 to the piezoelectric bimorph element 14.
It is connected with PC2and MPU100 transmits and receives the data of the position information on a pointeretc. between PC2.
<DP N=0005><TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300>[0033]The signal generating circuit 101 detects the hand of cut and rotation of the mouse ball 13 using publicly known meanssuch as a potentiometer or an encodergenerates the signal which shows the movement magnitude of the mouse 1 based on this hand of cut and rotationand outputs the generated signal to MPU100. MPU100 sends this signal to PC2 via the connecting cable 12and moves the position of the pointer 30 based on this signal in PC2.
[0034]Voltage not more than direct-current 30V which the booster circuit 102 is a publicly known pressure-up type DC-DC converterand is supplied to the booster circuit 102 via the connecting cable 12 from PC2 (usually) The voltage beyond direct-current 40V (about [Usually 200] V) required since the piezoelectric bimorph element 14 drives about 5V is raised. ON-and-OFF control of this booster circuit 102 is carried out by the signal outputted from MPU100.
[0035]As the drive circuit 103 is mentioned laterthe piezoelectric bimorph element 14 is made to drive by supplying the voltage which rose by the booster circuit 102 to the piezoelectric bimorph element 14 via the leads 16 and 17 or 18. This drive circuit 103 operates according to the signal outputted from MPU100.
[0036]Composition which carries out direct supply of the voltage which rose by the booster circuit 102 from the booster circuit 102 to the piezoelectric bimorph element 14 may be usedwithout forming the drive circuit 103.
[0037]<A HREF="JP-A-2001-202195.files/000007.gif">Drawing 5 </A>is a circuit diagram showing connection of the booster circuit 102 in the embodiment of the invention 1the drive circuit 103and the piezoelectric bimorph element 14. In <A HREF="JP-A-2001-202195.files/000007.gif">drawing 5</A>the drive circuit 103 supplies the voltage which rose by the booster circuit 102 to the piezoelectric bimorph element 14 by flowing through the terminals 103a and 103b or the terminals 103a and 103crespectively. Herewhen the drive circuit 103 flows through the terminals 103a and 103bvoltage is supplied to the metal plate 142therefore the piezoelectric element 141 contracts in the length direction. Therebythe piezoelectric bimorph element 14 is crooked caudad. When the drive circuit 103 flows through the terminals 103a and 103cvoltage is supplied to the electrode 140a andas a resultthe piezoelectric element 140 contracts in the length direction. Therebythe piezoelectric bimorph element 14 is crooked up.
[0038]Thuswhen the piezoelectric bimorph element 14 is crooked upthe mouse button 11 connected with the piezoelectric bimorph element 14 as mentioned above is raised. In this casewhen the mouse button 11 is pressed by the usera pressure

is added to the piezoelectric bimorph element 14andas a resultthe potential of the electrode 140a of the piezoelectric element 140 changes. MPU100 is supervising the potential of the electrode 140a by measuring the voltage of the both ends of the resistance R. And <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300>when it is detected that the potential of the electrode 140a carried out specified quantity change when the voltage of the both ends of the resistance R changedMPU100 judges that the mouse button 11 was pressed by the user.
[0039]<A HREF="JP-A-2001-202195.files/000008.gif">Drawing 6 </A>is a flow chart which shows the procedure of MPU100 in the embodiment of the invention 1. MPU100 is supervising the output from the signal generating circuit 101. When a user moves the mouse 1 here and the mouse ball 13 rotates in connection with thisthe signal generating circuit 101 generates the mouse shift signal which shows the movement magnitude of the mouse 1 based on the hand of cut and rotation of the mouse ball 13and outputs this mouse shift signal to MPU100.
[0040]MPU100 receives the mouse shift signal outputted from the signal generating circuit 101when it is judged that the mouse 1 moved (it is YES at S101)outputs the signal which shows switch control to the booster circuit 102and makes the booster circuit 102 an ON state (S102). Therebythe booster circuit 102 raises the voltage currently supplied from PC2. The drive circuit 103 is making it flow through the terminals 103a and 103b at this time. Thereforethe voltage which rose by the booster circuit 102 will be supplied to the metal plate 142andas a resultthe piezoelectric bimorph element 14 will be crooked caudad. When not receiving a mouse shift signal from the signal generating circuit 101 (it is NO at S101)Step S101 is repeated until it receives this signal.
[0041]PC2 sends the tactile information output signal which orders the output of tactile information to MPU100when the pointer 30 reaches a position with a specific position etc. by which the object of the icon 31 or the window 32 grade is arranged. This specific position can be set up in PC2.
[0042]It is judged whether MPU100 received the tactile information output signal from PC2 (S103). When it judges with not having received a tactile information output signal here (it is NO at S103)MPU100 judges whether movement of the mouse 1 stoppedin order not to receive the mouse shift signal outputted from the signal generating circuit 101 (S104). When it judges with movement of the mouse 1 having stopped here (it is YES at S104)it is judged whether it passed for 10 seconds after it starts a time check from the time of judging and the mouse 1 suspends movement (S105).
[0043]When it judges with having passed for 10 seconds at Step S105 (it is YES at S105)MPU100 outputs the signal which shows OFF control to the booster circuit 102makes the booster circuit 102 an OFF state (S106)and returns to Step S101.
[0044]When it judges with movement of the mouse 1 not having stopped at Step S104 on the other hand (it is NO at S104)And since the mouse shift signal outputted from the signal generating circuit 101 after movement of the mouse 1 stops before passing for 10 seconds was receivedwhen it judges with the mouse 1 not having stopped for 10 seconds (it is NO at S105)it <DP N=0006><TXF FR=0001 HE=250 WI=080 LX=0200 LY=0300>returns to Step S103.
[0045]When it judges with having received the tactile information output signal from the mouse 1 at Step S103 (it is YES at S103)MPU100The drive start control signal which shows making the piezoelectric bimorph element 14 drive so that it may be crooked upward is outputted to the drive circuit 103 by shrinking the piezoelectric element 140 of the piezoelectric bimorph element 14 (S107). Therebythe drive circuit 103 supplies the voltage which rose by the booster circuit 102 by flowing through the terminals 103a and 103c to the electrode 140a of the piezoelectric element 140 of the piezoelectric bimorph element 14. As a resultthe piezoelectric bimorph element 14 is crooked upand the mouse button 11 is raised.
[0046]NextMPU100 judges whether the mouse button 11 was pressed by whether the potential of the electrode 140a of the piezoelectric element 140 in the piezoelectric bimorph element 14 carried out specified quantity changeand the user (S108). When it judges with not having been pushed here (it is NO at S108)since the pointer 30 separated from the specific positionMPU100 judges whether the tactile-information stop signal which orders to suspend the output of tactile information was received from PC2 (S109). And when it judges with not having received a tactile-information stop signalit returns to NO) and Step S108 by (S109.
[0047]When it judges with the mouse button 11 having been pressed at Step S108 (it is YES at S108)Or when it judges with having received the tactile-information stop signal at Step S109 (it is YES at S109)MPU100 outputs the drive-stop-control signal which shows that a drive which is crooked upward in the piezoelectric bimorph element 14 is stopped to the drive circuit 103 (S110). Therebythe piezoelectric bimorph element 14 is caudad crooked by the drive circuit's 103 making it flow through the terminals 103a and 103band as a result

supplying voltage to the metal plate 142. Therebythe state where the mouse button 11 was raised is canceled. Thereforethe user can do the depression of the mouse button 11 by applying the usual pushing down force. He follows back MPU100 of Step S110 to Step S104.
[0048]The amount of change of the piezoelectric bimorph element 14 is controllable by adjusting the height of the voltage raised by the booster circuit 102. Thereforethe amount of change of the piezoelectric bimorph element 14 can also be arbitrarily set up by a user's liking.
[0049]It may be made to provide a projection in the surface of the mouse button 11. <A HREF="JP-A-2001-202195.files/000009.gif">Drawing 7 </A>is a side view of the mouse 1 of the embodiment of the invention 1 which provided the projection in the surface of the mouse button 11. The projection 19 is formed in the surface of the mouse button 11 as shown in <A HREF="JP-A-2001-202195.files/000009.gif">drawing 7</A>. When a user places a finger on this projection 19 and operates the mouse 1it <TXF FR=0002 HE=250 WI=080 LX=1100 LY=0300>becomes possible to give tactile information more effectively to a user.
[0050](Embodiment 2) <A HREF="JP-A-2001-202195.files/000010.gif">Drawing 8 </A>is a schematic diagram showing the appearance of the mouse blocking force apparatus of the embodiment of the invention 2. In <A HREF="JP-A-2001-202195.files/000010.gif">drawing 8</A>20 shows a mouse blocking force apparatus (henceforth a mouse)and the flexible region 22 which is different in the mouse button 11 is established in the upper part of the mouse case 21 of this mouse 20. Since other composition is the same as that of the mouse 1 of Embodiment 1identical codes are attached and explanation is omitted.
[0051]<A HREF="JP-A-2001-202195.files/000011.gif">Drawing 9 </A>is a partially broken side view of the mouse 20 of the embodiment of the invention 2. In <A HREF="JP-A-2001-202195.files/000011.gif">drawing 9</A>23 shows the piezoelectric bimorph element which functions as an electrostrictive actuatorand the inside of the mouse case 21 is equipped with this piezoelectric bimorph element 23. Since the composition of the piezoelectric bimorph element 23 is the same as the composition of the piezoelectric bimorph element 14 in Embodiment 1the explanation is omitted.
[0052]The holding part 24 which protruded inside is formed in the inner upper face of the mouse case 21and the end of the rectangle of the piezoelectric bimorph element 23 is being fixed by this holding part 24. The other end of the piezoelectric bimorph element 23 is connected with the rear face of the flexible region 22 inside the mouse case 21.
[0053]In the mouse 20 constituted in this waythe piezoelectric bimorph element 23 is driven like the piezoelectric bimorph element 14 in Embodiment 1. And when the piezoelectric bimorph element 23 is crooked upthe flexible region 22 is flattered.
[0054]In order to make it raised in the mouse button 11 in the case of the mouse 1 in Embodiment 1when there is operation performed while maintaining the state where the mouse buttons 11such as drag operationwere pressedtactile information cannot be fed back to a user. In the mouse 20 of Embodiment 2since the flexible region 22 which is different in the mouse button 11 is flattered as mentioned aboveeven if it is a case where drag operation etc. are being performedit becomes possible to feed back tactile information to a user.
[0055]
[Effect of the Invention]As explained in full detail aboveaccording to the information processing system according to claim 1 and the mouse blocking force apparatus according to claim 2tactile information can be fed back to a user by using a small and lightweight electrostrictive actuator as a tactile-information generation machinewithout spoiling operativity.
[0056]Since it can build in a device by using a small electrostrictive actuator as a tactile-information generation machinea tactile-information generation machine is hard to be destroyed.
[0057]<DP N=0007><TXF FR=0001 HE=165 WI=080 LX=0200 LY=0300>Since the whole mouse button can be raised by connecting an electrostrictive actuator with a mouse button according to the mouse blocking force apparatus according to claim 3it cannot be based on how to touch a mousebut tactile information can be fed back to a user.
[0058]When a user presses a mouse buttonby suspending the aggressiveness raising of a mouse buttonthe user can do the depression of the mouse button with the usual pushing down force.
[0059]By according to the mouse blocking force apparatus according to claim 4establishing a different flexible region from a mouse button in the upper part of a caseand connecting an electrostrictive actuator with this flexible regionEven if it is during the drag operation operated while pressing a mouse buttonthis invention does the outstanding effect so -- tactile information can be fed back to a user.
[0060](Additional remark) The following paragraphs are further indicated to explanation [still more more than].
(1) The mouse blocking force apparatus according to any one of claims 2 to 4 currently having made said booster circuit that pressure up of the input voltage not more than 30V should be

carried out to the output voltage beyond 40V.
(2) The mouse blocking force apparatus according to any one of claims 2 to 4 currently having made that it should have further a voltage control means which controls said voltage which roseand the drive of said piezo-electric AKUCHUE - TA should be controlled.
(3) The mouse blocking force apparatus according to any one of claims 2 to 4wherein the electrical link of the electrode which said piezo-electric AKUCHUE - TA hasand said booster circuit is made by the fixed side of piezo-electric AKUCHUE - TA.
(4) The mouse blocking force apparatus according to any one of claims 2 to 4wherein the projection is prepared for said mouse button or said flexible region.
(5) Said booster circuit raises the voltage supplied from said information processor when said mouse blocking force apparatus is operatedThe <TXF FR=0002 HE=015 WI=080 LX=1100 LY=0300>mouse blocking force apparatus according to any one of claims 2 to 4 currently having made that said rise should be suspended when said mouse blocking force apparatus is not operated beyond as for predetermined time.
</SDO>
<HR><B>DESCRIPTION OF DRAWINGS</B><HR><SDO EDJ><TXF FR=0003 HE=150 WI=080 LX=1100 LY=0450>[Brief Description of the Drawings]
<A HREF="JP-A-2001-202195.files/000003.gif">[Drawing 1]</A>It is a key map showing the example of composition of the information processing system of this invention.
<A HREF="JP-A-2001-202195.files/000004.gif">[Drawing 2]</A>It is a schematic diagram showing the appearance of the mouse of the embodiment of the invention 1.
<A HREF="JP-A-2001-202195.files/000005.gif">[Drawing 3]</A>It is a partially broken side view of the mouse of the embodiment of the invention 1.
<A HREF="JP-A-2001-202195.files/000006.gif">[Drawing 4]</A>It is a block diagram showing the electric constitution of the mouse of the embodiment of the invention 1.
<A HREF="JP-A-2001-202195.files/000007.gif">[Drawing 5]</A>It is a circuit diagram showing connection of the booster circuit in the embodiment of the invention 1a drive circuitand a piezoelectric bimorph element.
<A HREF="JP-A-2001-202195.files/000008.gif">[Drawing 6]</A>It is a flow chart which shows the procedure of MPU.
<A HREF="JP-A-2001-202195.files/000009.gif">[Drawing 7]</A>It is a side view of the mouse of the embodiment of the invention 1 which provided the projection on the surface of the mouse button.
<A HREF="JP-A-2001-202195.files/000010.gif">[Drawing 8]</A>It is a schematic diagram showing the appearance of the mouse of the embodiment of the invention 2.
<A HREF="JP-A-2001-202195.files/000011.gif">[Drawing 9]</A>It is a partially broken side view of the mouse of the embodiment of the invention 2.
[Description of Notations]
1 Mouse blocking force apparatus
10 Mouse case
11 Mouse button
13 Mouse ball
1423 piezoelectric-bimorph element
22 Flexible region
101 Signal generating circuit
102 Booster circuit
103 Drive circuit
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